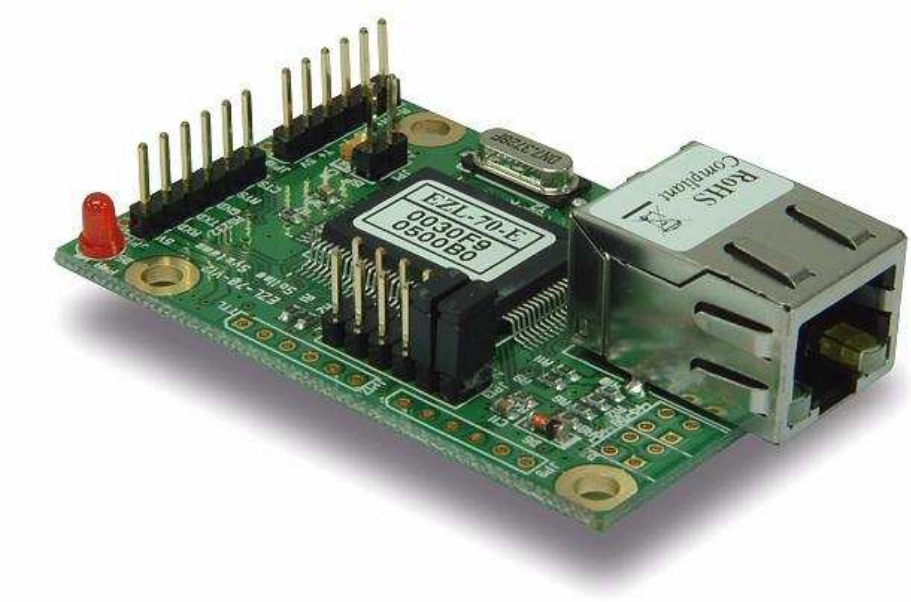
EZL-70 User's Manual

Version 1.4



Sollae Systems

To all residents of the European Union

Important environmental information about this product

This symbol on this unit or the package indicates that disposal of this unit after its lifecycle could harm the environment. Do not dispose of the unit as unsorted municipal waste; it should be brought to a specialized company for recycling. It is your responsibility to return this unit to your local recycling service. Respect your local environmental regulation. If in doubt, contact your local waste disposal authorities.

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1. Overview

1.1. Overview

Along with the development of the Internet, the demand for data communication functions has increased recently. Data communication over the Internet requires using TCP/IP, the Internet communication protocol. That is to say, in order to connect a system to the Internet, TCP/IP protocol must be implemented. It is possible to implement TCP/IP by directly implementing the protocol, porting public TCP/IP, or using Operating System (OS). However, all these methods impose burdens on the developer in time, cost, and technology.

ezTCP series, a Serial ↔ TCP/IP protocol converter product group of Sollae Systems, enables you to use TCP/IP communication (the Internet communication) function simply by "connecting the cable to a serial port". ezTCP sends data from the serial port to the Internet network after TCP/IP processing, and vice versa.

EZL-70 in ezTCP product group is a product that provides TCP/IP communication through Ethernet. In other words, like other ezTCP products, EZL-70 sends data from the serial port to the LAN after TCP/IP processing and vice versa.

It provides DHCP and PPPoE functions as well as TCP/UDP/IP, so that it can be applied to the cable network and the xDSL network.

EZL-70 is a modular and embedded type that supports RS232, RS422, RS485 and TTL(5V) interface, so it can be used various applications.

1.2. Components

- EZL-70 Body

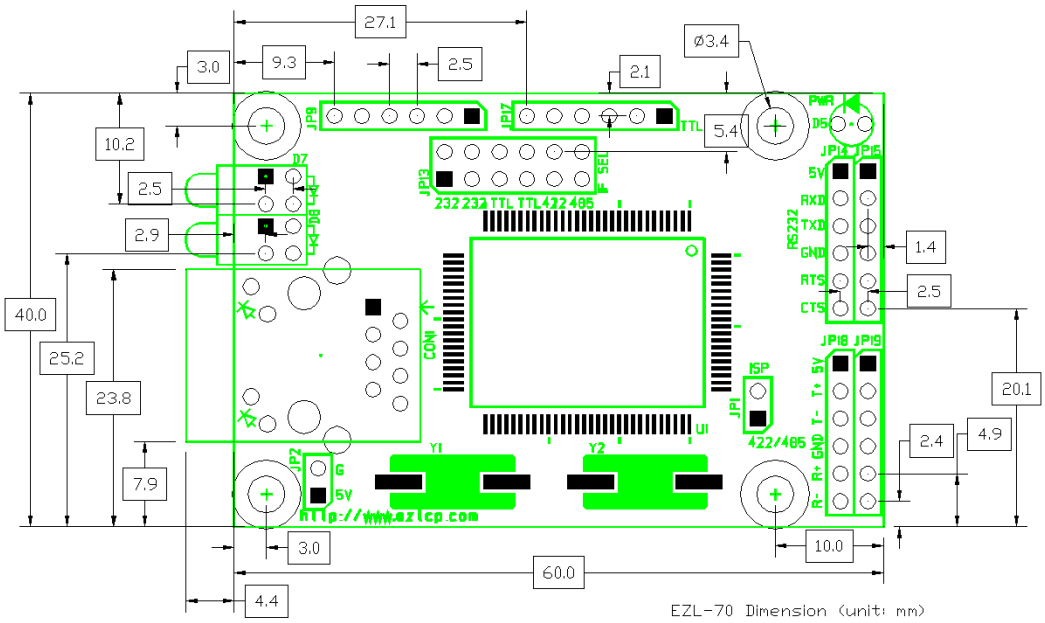
1.3. Specifications

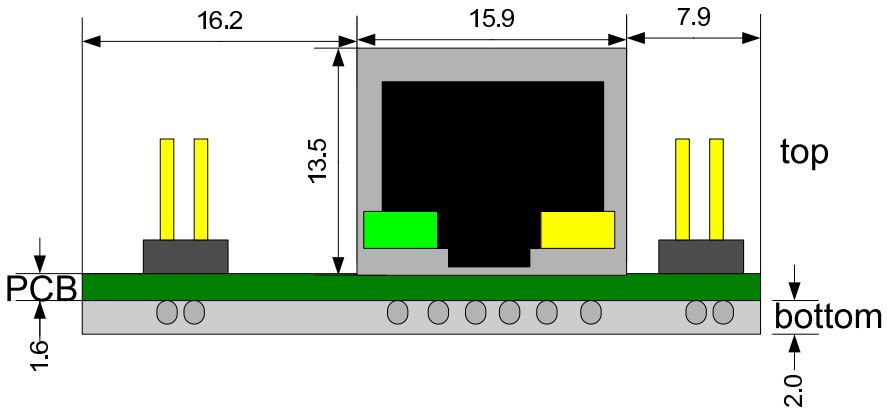
Power	Input Voltage	5V (±10%)
	Current	60mA typical
Dimension	64.4mm x 40mm x 17mm	
Weight	About 20g	
Interface	Serial	2.54mm pitch 1x6 connector (RS232, RS422, RS485, TTL(5V))
	Network	RJ-45 connector
Serial Port	UART (1,200bps ~ 115,200bps)	
Network	10Base-T	
Protocols	TCP, UDP, IP, ICMP, ARP, DHCP, PPPoE	
Communicat-ion Mode	T2S	TCP Server Mode
	COD	TCP Client Mode
	ATC	TCP Server/Client Mode (AT command emulation)
	U2S	UDP
Utilities	ezConfig	Configuration utility via LAN
	ezTerm	Socket test utility
	hotflash	Firmware download utility via TFTP

☞ **You can download free utilities and firmware from http://www.eztcp.com**

1.4. Dimension

The dimension of EZL-70 is followed. The unit is millimeters.





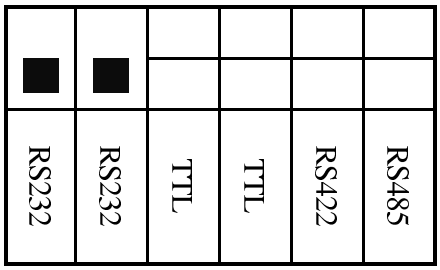
1.5. Power

Power of EZL-70 can be provided from of VCC and GND pins of JP13, JP14, JP15, JP18, JP19, and JP2. The voltage should be 5V.

1.6. Serial Interface

EZL-70 provides RS232, RS422, RS485, and 5V-TTL interfaces. Each interface is selected by JP13 jumper as follows.

1.6.1. RS232



The RS232 ports are JP14 and JP15. JP14 is 1x6 2.54mm pitch male header. And JP15 isn't soldered so that user interfaces JP15 with user-own connector.

The pin specification is followed:

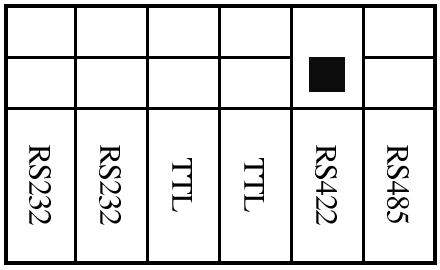
#	Name	Descriptions	I/O	Mandatory	Optional
1	VCC	VCC(5V)	Power	●	
2	RXD	Receiving data from serial device(RS232) It should be connected to TXD of serial device.	IN	●	
3	TXD	Transmitting data to serial device(RS232) It should be connected to RXD of serial device.	OUT	●	
4	GND	Ground	Power	●	
5	RTS	When RTS/CTS flow-control is used, indicating whether EZL-70 has receiving buffer or not to serial port. (RS232) It should be connected to CTS of serial device.	OUT		●
6	CTS	When RTS/CTS flow-control is used, EZL-70 checks receiving buffer of serial device (RS232) It should be connected to RTS of serial device.	IN		●

[JP14 and JP15]

1.6.2. RS422

RS422 communicates with differential voltage. The transmission and receiving lines are separated, so RS422 is full-duplex.

For RS422, JP13 should be as followed:



The RS422 ports are JP18 and JP19. JP18 is 1x6 2.54mm pitch male header. And JP19 isn't soldered so that user interfaces JP19 with user-own connector.

The pin specification is followed:

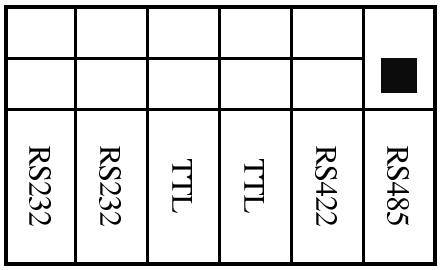
#	Name	Descriptions	I/O	Mandatory	Optional
1	VCC	VCC(5V)	Power	●	
2	T+	Differential output data +	OUT	●	
3	T-	Differential output data -	OUT	●	
4	GND	Ground	Power	●	
5	R+	Differential input data +	IN	●	
6	R-	Differential input data +	IN	●	

[JP18 and JP19]

1.6.3. RS485

RS485 communicates with differential voltage. The transmission and receiving lines are shared, so RS485 is half-duplex.

For RS485, JP13 should be as followed:



The RS485 ports are JP18 and JP19. JP18 is 1x6 2.54mm pitch male header. And JP19 isn't soldered so that user interfaces JP19 with user-own connector.

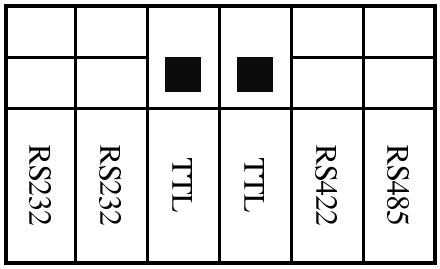
The pin specification is followed:

#	Name	Descriptions	I/O	Mandatory	Optional
1	VCC	VCC(5V)	Power	●	
2	T+	Differential input/output data +	OUT	●	
3	T-	Differential input/output data -	OUT	●	
4	GND	Ground	Power	●	
5	R+	Not used (Do not connect)			
6	R-	Not used (Do not connect)			

[JP18 and JP19]

1.6.4. TTL (5V)

EZL-70 can communicate with TTL level. The below is the JP13 for TTL level.



The TTL port is JP17. JP17 is not soldered so that user interfaces it with user-own connector. The pin specification is followed:

#	Name	Descriptions	I/O	Mandatory	Optional
1	VCC	VCC(5V)	Power	●	
2	RXD	Receiving data from serial device(TTL) It should be connected to TXD of serial device.	IN	●	
3	TXD	Transmitting data to serial device(TTL) It should be connected to RXD of serial device.	OUT	●	
4	GND	Ground	Power	●	
5	RTS	When RTS/CTS flow-control is used, indicating whether EZL-70 has receiving buffer or not to serial port (TTL) It should be connected to CTS of serial device.	OUT		●

6	CTS	When RTS/CTS flow-control is used, EZL-70 checks receiving buffer of serial device (TTL) It should be connected to RTS of serial device.	IN		•

[JP17]

1.7. ISP jumper

The firmware of EZL-70 can be downloaded through the Ethernet (LAN). To download its firmware, user should set ISP jumper and power on. Then the EZL-70 operates as ISP mode. The firmware is supplied from Sollae Systems.

1.8. LED Interface

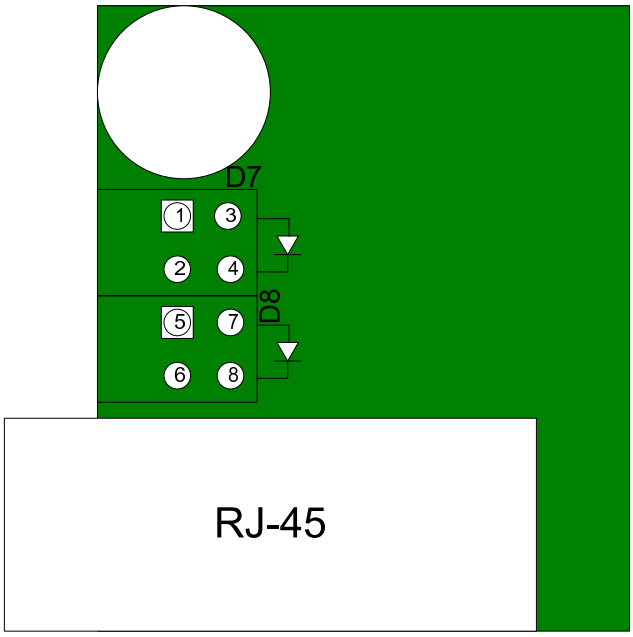
1.8.1. RJ45 and Power LED

There are yellow and green LEDs in the RJ-45 connector of EZL-70. The yellow LED indicates that IP address status of EZL-70 and packet transmissions from LAN port. And the green LED turns on when EZL-70 connected a hub and blinks when packet receptions.

Color	Description
Yellow (Status / LAN Transmission)	IP is allocated but TCP connection is not established Blinks every 500ms
	IP is not allocated – Repetition of [after blinking 4 times for 150ms, turns off during 850ms]
	During TCP connection – LOW
	ISP Mode – blinking every 50ms
	Blinking when EZL-70 transmits data to the LAN
Green	ON - When connected to LAN
	Blinking – When receiving packets from the LAN.
Red	ON – When power is being supplied.

1.8.2. LED interface – D7 and D8

User can interface user own LED. No additional LED is required, because 330ohm resistor is included in the EZL-70.



#	A/C	Name	Description
1	Anode	STS	IP is allocated but TCP connection is not established Blinks every 500ms
			IP is not allocated – Repeat of [after blinking 4 times for 150ms, turns off during 850ms]
2	Cathode		ON - During TCP connection
			ISP Mode - Blinks every 50ms
3	Anode	LINK	ON – when EZL-70 is connected to a hub
4	Cathode		
5	Anode	LAN RXD	Blinking– when EZL-70 receives packet from the LAN
6	Cathode		
7	Anode	LAN TXD	Blinking– when EZL-70 transmits packet from the LAN

1.9. Ethernet Address (MAC address)

Ethernet devices have unique 6 bytes-hardware address. The hardware address of EZL-70 is set in the factory. The hardware address cannot be modified.

The address is printed in top of EZL-70.

2. Installation and Test Run

The followings are described on the assumption that the serial interface is RS232.

2.1. Installation Method

You can install EZL-70 in the following steps:

Title	Item	Sub-item	Description
1. Checking the communication environment	Check items	IP address environment	3.1.
		Serial port settings	3.1.
		Application program to be used	4.
2. Setting serial interface	Setting	Selecting the serial interface with JP13.	1.6.
2. Connecting to the network	Check method	Check if LINK LED is ON.	1.8.
3. Configuring the environmental variables	Configuration method	Set by ezConfig, a utility program for configuration through the network.	3.2.
		Set by AT commands in ATC mode	3.3.
	Configuration items	IP address related items	3.1.
		Serial port related items	3.1.
		Communication mode (Decided depending on application program)	4.
4. Application to the field			

2.1.1. Checking the Communication Environment

Before installing EZL-70, check the network environment where EZL-70 is to be installed, including the followings matters:

- IP address environment (Local IP, Subnet Mask, Gateway, etc.)
- Serial interface types of the equipment (RS232, RS422, RS485, TTL)
- Serial port items of the equipment to which EZL-70 is going to be connected (Baud Rate, Data Bits, Parity, Stop Bit)

- Application program protocol to be used (TCP/UDP, Server/Client, etc.)

☞ **For application program protocol to be used, see *"5. Normal* Communication Mode".**

2.1.2. Selecting Serial Interface

EZL-70 can be interfaced with RS232, RS422, RS485 and 5V-TTL to the serial equipment. For each interface, user should set JP13 properly with jumpers.

☞ **For more information, refer to 1.6. Serial Interface.**

2.1.3. Connecting to the Network

Connect power to EZL-70, and connect EZL-70 directly to the Ethernet port of the PC where test is to be performed with a cross-over Ethernet cable.

2.1.4. Configuring the Environmental Variables

When network connection is completed, configure the environmental variables such as IP address related items, serial port related items, and communication mode related items through the LAN using "ezConfig," the environmental variable configuration program.

☞ **For environmental variable configuration, see *"3.*Configuring IP Address and Environmental Variables."**

2.2. Test

You can perform test run according to the following orders. The test run described here is based on the assumption that the IP address of the PC is set to 10.1.0.2.

2.2.1. Changing PC IP Address

You can change the IP address of your PC as follows:

IP Address	10.1.0.2
Subnet Mask	255.0.0.0
Gateway IP Address	0.0.0.0

2.2.2. Installation EZL-70

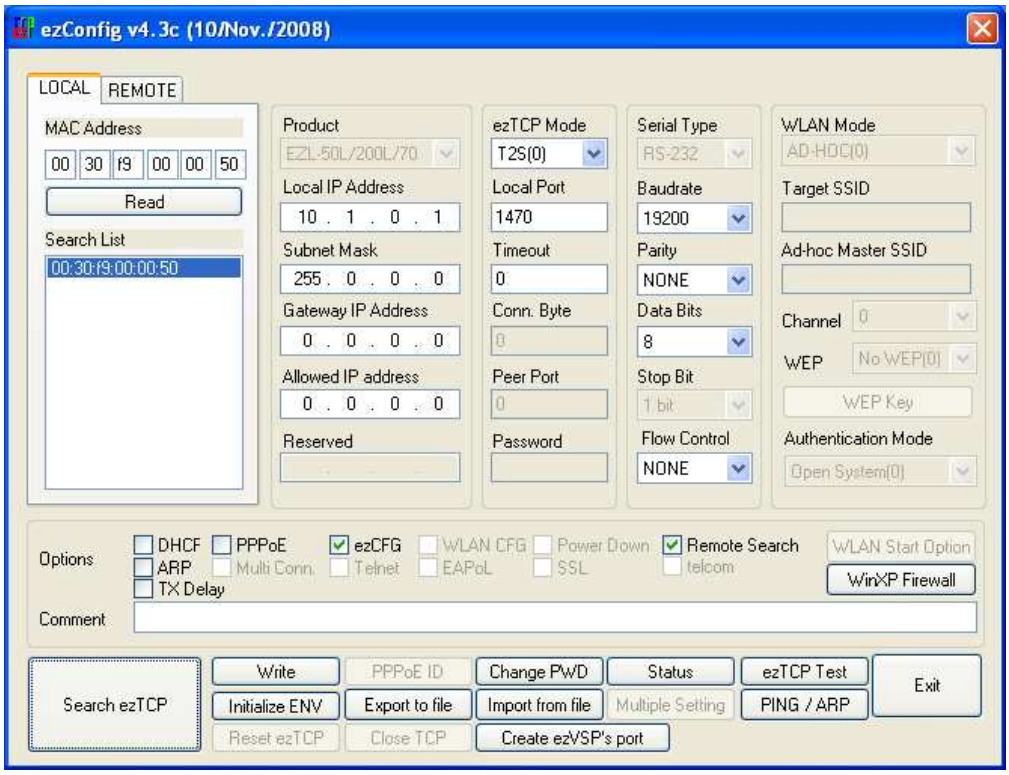
Connect RS232 cable between your PC and EZL-70, and the LAN cable to the hub to which the PC is connected or directly to the PC with a cross-over cable, and 5V power for power supply. If the LAN cable has been correctly connected when power is supplied, the red LED turns on, and the green LED turns on and the green LED blinks sometimes.

2.2.3. Configuring EZL-70

Configure EZL-70 setting using ezConfig, the ezTCP configuration program, as follows. Run ezConfig, and click [Search ezTCP] button in the ezConfig window. And, ezConfig program will search all ezTCPs on the local network.

When ezTCP is searched, MAC address of the ezTCP is displayed on the [Search List] window (The MAC address is printed in top of EZL-70).

Select the corresponding MAC address, and set the same as shown in the following figure and click [Write] button to save the settings.



2.2.4. Connecting to the PC Serial Port

Connect the serial port of your PC and that of EZL-70, using the supplied serial communication cable. Then, run serial communication program such as Hyper Terminal or Tera Term. When the program is run, select the same serial port values as those set to EZL-70 [19,200bps, Data Bits: 8 bits, Stop Bit: 1 bit, Parity: None], which will finish the preparation for serial communication.

2.2.5. Communication Test

When the preparation for serial communication is finished, enter the following in the DOS window on your PC, to connect to TCP through Telnet program.

"Telnet 10.1.0.1 1470"

When TCP connection succeeds, Yellow LED of RJ-45 turns ON.

When this LED turns ON, enter “123” on the Telnet window, and "123" will appear on the hyper terminal. Enter “ABC” on the hyper terminal, and “ABC” will appear on the Telnet window. Otherwise, communication test fails.

3. Configuring IP Address and Environmental Variables

3.1. IP Address and Environmental Variables

For TCP/IP communication, you must set IP address related items. In addition, you have to set serial port related items (Baud Rate, Data Bits, Parity, Flow Control and etc) to EZL-70.

You can set the IP address and the serial port related items by using ezConfig, the supplied configuration utility which allows you to configure your EZL-70 over the network, or by using AT commands in ATC mode.

	Item	Description
IP Address-related Items	Local IP Address	IP address of EZL-70
	Subnet Mask	Subnet Mask
	Gateway IP Address	IP address of gateway
	Local Port	TCP listen port number in T2S mode Port number for waiting data in U2S mode
	Peer IP Address	IP address to connect/transmit in COD and U2S mode
	Peer Port	Port number to connect/transmit in COD and U2S mode
	Allowed IP Address	Allowed IP address in T2S mode
Serial Port	Baud Rate	1,200bps ~ 115,200bps
	Data Bits	7,8
	Parity	NONE, EVEN, ODD
	Stop Bit	1
	Flow Control	NONE, RTS/CTS, XON/XOFF
Communication Mode	ezTCP Mode	Set communication Mode (T2S, ATC, COD, U2S)
Connect/Disconnect Event	Conn. Byte	Minimum number of bytes attempting to connect/transmit
	Timeout	Limit time to keep connection

Configuration Method Used	ezConfig	Enable ezConfig function.
	Remote Search	Remote configuration function with UDP unicast
	Password	ezConfig password.
	ARP	Enable IP setting by ARP.
Dynamic IP Address	DHCP	Select to receive EZL-70 IP address as DHCP.
	PPPoE	Select to receive EZL-70 IP address as PPPoE.
	PPPoE ID & Password	ID and password to be used for PPPoE

- Local IP Address

It represents the IP address of EZL-70. If you set DHCP or PPPoE is set, an IP address is automatically allocated. So, you cannot set the local IP address.

- Subnet Mask

Set subnet mask of the network where EZL-70 is installed

- Gateway IP Address

Set the gateway IP address of the network where EZL-70 is installed.

- Allowed IP Address

It is a permitted IP address of foreign host when EZL-70 operates as a server (T2S mode). The only host that is written in this item can connect to EZL-70. If Allowed IP Address is 0.0.0.0, all hosts can connect to the EZL-70.

- Local Port

Port number, which is used as TCP port number waiting to be connected when EZL-70 operates as TCP server or as the port number waiting for UDP data when it operates in U2S mode.

- Peer Port

Local port number of the server to connect when EZL-70 operates as TCP client or to transmit UDP data when it operates as U2S

- Serial Type

It cannot be set in ezConfig. User can set it by JP13 (RS232, RS422, RS485).

- Baud Rate

Select a serial port speed (1,200 bps ~ 115,200bps).

- Data Bits

Select a data bit length of the serial port (7 bits or 8 bits)

- Parity

Select a parity bit of the serial port (None, Even, Odd).

- Stop Bit

Select a stop bit length of the serial port (1 bit fixed).

- Flow Control

Select flow control for the serial port (None, RTS/CTS, XON/XOFF).

- ezTCP Mode

Select the communication mode of EZL-70 (T2S, ATC, COD and U2S).

- Conn. Byte

It decides a point of time to start connection when EZL-70 operates as COD. EZL-70 starts to connect to the host (Peer IP Address and Peer Port) of the designated host upon receiving as many data as specified by [Conn. Byte] from the serial port.

- Block

Decide the size of UDP packet to be sent at a time when EZL-70 operates as U2S.
(Unit: Byte)

- Timeout

When EZL-70 operates as TCP such as T2S, COD and ATC, connection is closed if data communication is not continued as long as the time set to this item unless this item is set to 0. (Unit: second)

- Interval

When EZL-70 operates as UDP like U2S, it transmits data in blocks by gathering data for the time set to this item (Unit: 10ms)

- ezCFG

You can use ezConfig utility only this item is enabled.
(If this item is not enabled, you cannot set EZL-70 using ezConfig. Therefore, it is recommended to enable this all the times.)
To enable ezConfig, set this item in ISP mode.

- Remote Search

If this item is set, EZL-70 in other network can be configured by ezConfig. Remote Search function is performed in the [REMOTE] tab.

- Password

Set a password for configuring with ezConfig. If user forgot the password, the user can delete the password in ISP mode.

- ARP

When this item is selected, EZL-70 uses the destination IP address of the first packet coming to its MAC address as its own IP address temporarily.

- DHCP

Set to receive an IP address as DHCP.

- PPPoE

Set to receive an IP address as PPPoE.

- TX Delay

Give delay to between each data on serial port. This option is useful to serial devices that have no buffer system or slow baud rate (delay: 200㎲, maximum baud rate 19,200bps).

- Comment

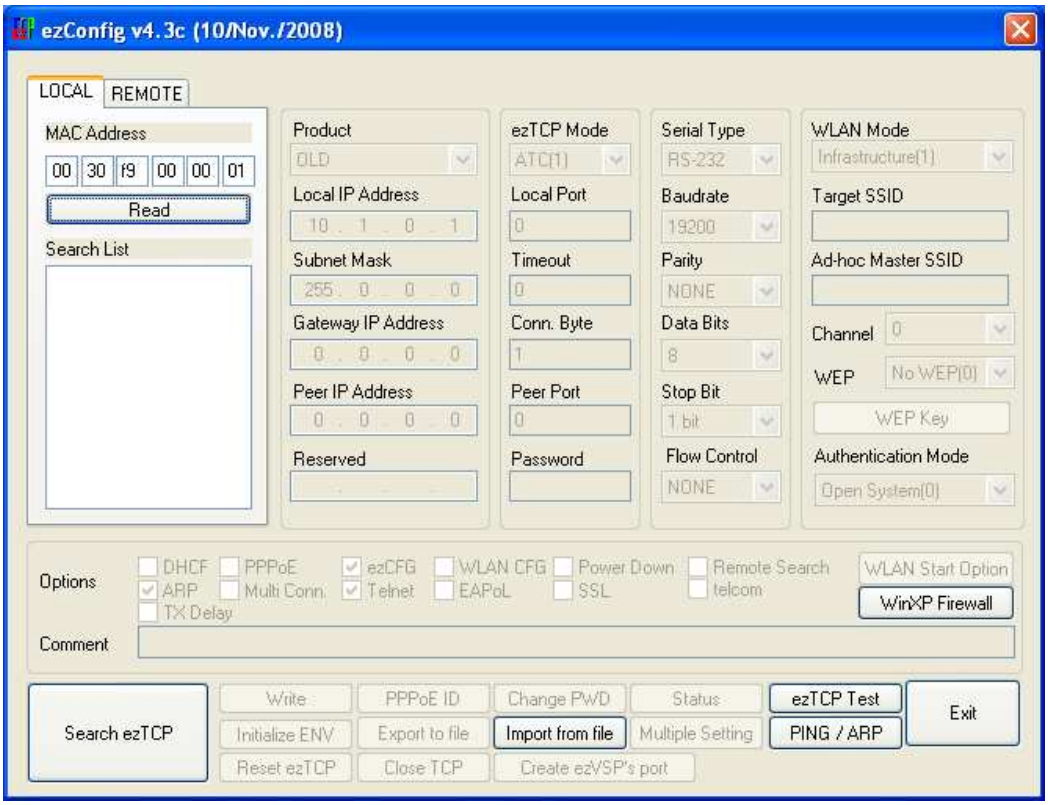
Store comments (maximum 32 bytes) of user on the product. This item helps the user distinguish each EZL-70 more easily.

3.2. Configuration by ezConfig

3.2.1. ezConfig Menu

The basic environmental variables (IP address related items, serial port items, and etc.) can be set by ezConfig which is an integrated management tool for Windows.

ezConfig can be operated in Microsoft Windows platform(Windows 98, 98 SE, 2000, ME, XP, Vista) but may malfunction in older OS versions. Following is the screen shot of ezConfig which is just launched.



√ *ezConfig can set not only EZL-70's* environmental variables but also other ezTCP series.

ezConfig configures ezTCP by Ethernet, there are two way to configure.

The first way is UDP broadcast. When using UDP broadcast, user can search all ezTCPs in the same network without knowledge of IP address. But beware that it can be used in the 'same network'. This method performed in the [LOCAL] tab of ezconfig version above 4.0.

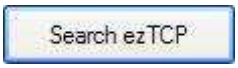
The second way is UDP unicast that communicates by IP address. As it configured with IP address, EZL-70 is configured any place if they are connected with network. This method performed in the [REMOET] tab of ezconfig version above 4.0.

(ezConfig below version 4.0 supports only UDP broadcast)

	LOCAL	REMOTE
communication	UDP broadcast	UDP unicast (port: 50005)
search	With MAC address	with IP address
location	In the same network with EZL-70	Can be used in a different network

The functions of ezConfig's buttons are followed:

If PC's windows firewall is enabled, ezConfig may not work correctly. User can run windows firewall setting program easily by using this button.



This button is used to search for all of the network-attached ezTCPs. The search results will be displayed on the [Search List] box and you can select an item using a mouse or cursor as required. The value displayed on the box indicates the MAC ADDRESS of each ezTCP. The selected setup value of ezTCP will be displayed on the right side.

[LOCAL] tab:

You can see only the ezTCP configuration values if you press this button after entering the 6-digit hexadecimal number printed on the ezTCP main body in the MAC ADDRESS box. It is useful when there are too many ezTCPs attached to the network to search for one from the LIST box.

[REMOTE] tab:

Read environmental variables with the IP address.

This button is used to save the changed value in ezTCP after modifying the configuration. Make sure not to press this button during operating ezTCP since ezTCP will automatically be reset right after its environment setup value is saved. Otherwise, it may cause malfunction.

Set ID and password used for PPPoE.

EZL-70 uses maximum 32 byte for saving an ID and 8 bytes for a password.

Change PWD ezTCP provides User Authentication function to prevent an unwanted person from modifying the configuration. The authentication process is performed through the password string verification. When entering or changing the password strings, you can use this button. Changing the ezTCP configuration details if a password has been entered requires the proper password to be entered in the PASSWORD field.

√ **If you forget the password, erase or reenter in ISP Mode.**

Status This button is used to read a dynamic status during operating ezTCP. Pressing this button will display a new window, where the time-elapsed after the power is on, the current IP address, and the data throughput of the serial port are indicated. Double-clicking each item on the [Search List] will carry out the same function.

ezTCP Test Run test program for serial interface.

Initialize ENV

This button is used to initialize the environment parameter of ezTCP.

Export to file | Import from file | Multiple Setting

This button is used to save or load the environment parameters of ezTCP as binary file format. For more details, refer to **ezTCP Technical Documents** [How to write same environment variables] on our supporting webpage.

PING / ARP

This button is used to do "PING TEST" for checking if the set IP address of ezTCP is correct

Reset ezTCP

Reboot the ezTCP. The ezTCP must use password for using this button.

Close TCP

Close currently TCP connection between ezTCP and any peer host. The ezTCP must use password for using this button.

Create ezVSP's port Automatic creation a virtual serial port of ezVSP program for currently searched ezTCP. This is only supported over ezConfig version 4.3c and ezVSP version 2.2h.

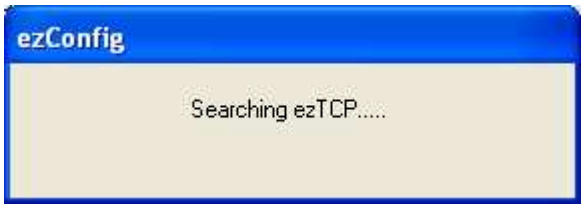
Exit Exit program.

3.2.2. Example configuration of ezConfig (LOCAL)

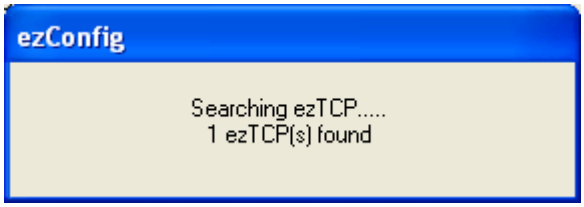
ezConfig can be used to change the IP address related items, the serial port setup value, the serial port operation mode. This section describes these functions briefly. For more information, see the following sections.

The following example shows how to read and change ezTCP's basic functions. Try changing ezTCP setup value according to the following sequence

- When the ezTCP power is turned on and the LAN cable is connected correctly, pressing [Search] or [Read] button will display the following window:



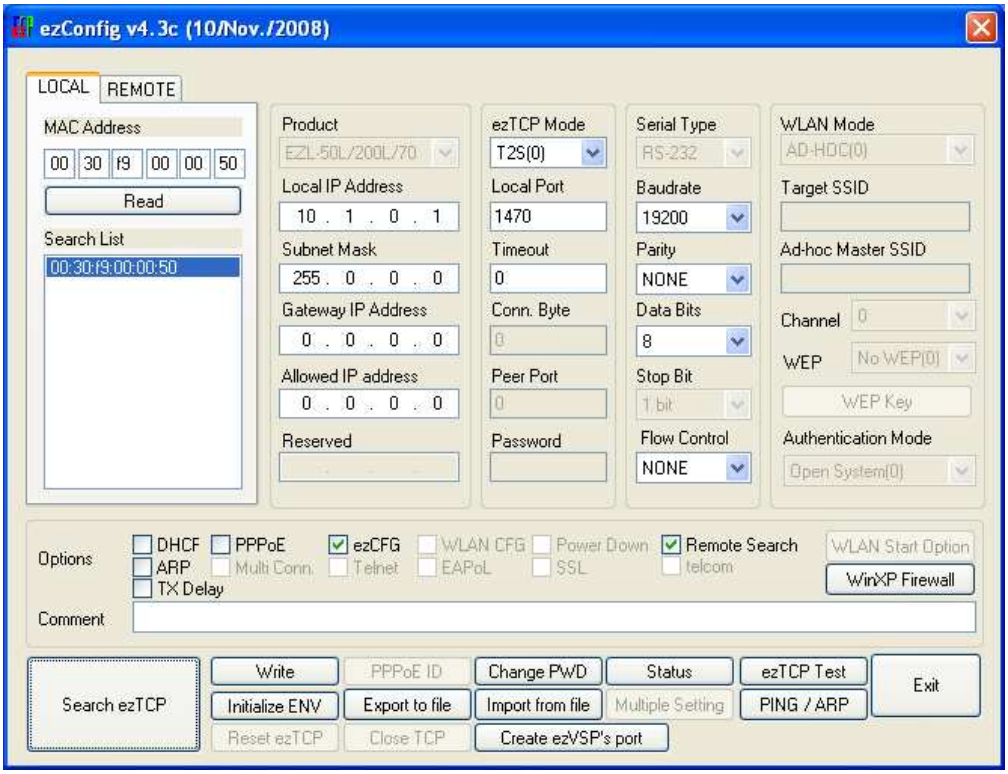
- If a network-attached ezTCP is detected, the following message will be displayed. If a message pops up indicating that there is no response from ezTCP, check that the power is turned on and the cable is connected correctly, then try pressing [Search] or [Read] button.



√ It is impossible to use ezConfig, if EZCFG check box is disabled. This function can be re-enabled in ISP mode.

- If more than one ezTCP are detected, ezTCP's MAC ADDRESS will be displayed in the [Search List] box on ezConfig. Check if the MAC ADDRESS displayed in the [Search List] window corresponds to that printed on ezTCP main body. The following screen shows this process:

Following is the screenshot when ezTCPs were found.



- Set [ezTCP Mode], [Local IP Address], [Local Port], and serial port related items. After setting press [Write] button. If there is any error during writing process, check the LAN between PC and EZL-70.

- Check if the set IP address is correct with ping command in DOS prompt. Following is the message if the IP address is OK. If "Request timed out" message is shown, check IP address.

Or user can check the set IP address by using PING / ARP button.

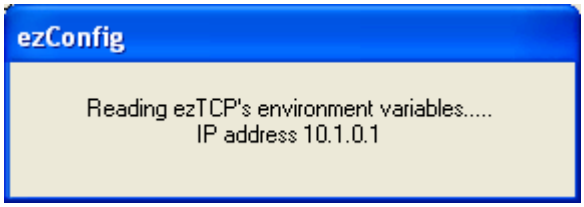
```
C:₩>ping a.b.c.d
Pinging a.b.c.d with 32 bytes of data:
Reply from a.b.c.d: bytes=32 time=1ms TTL=64
Reply from a.b.c.d: bytes=32 time=1ms TTL=64
Reply from a.b.c.d: bytes=32 time=1ms TTL=64
Reply from a.b.c.d: bytes=32 time=1ms TTL=64
```

<When IP address is a.b.c.d.>

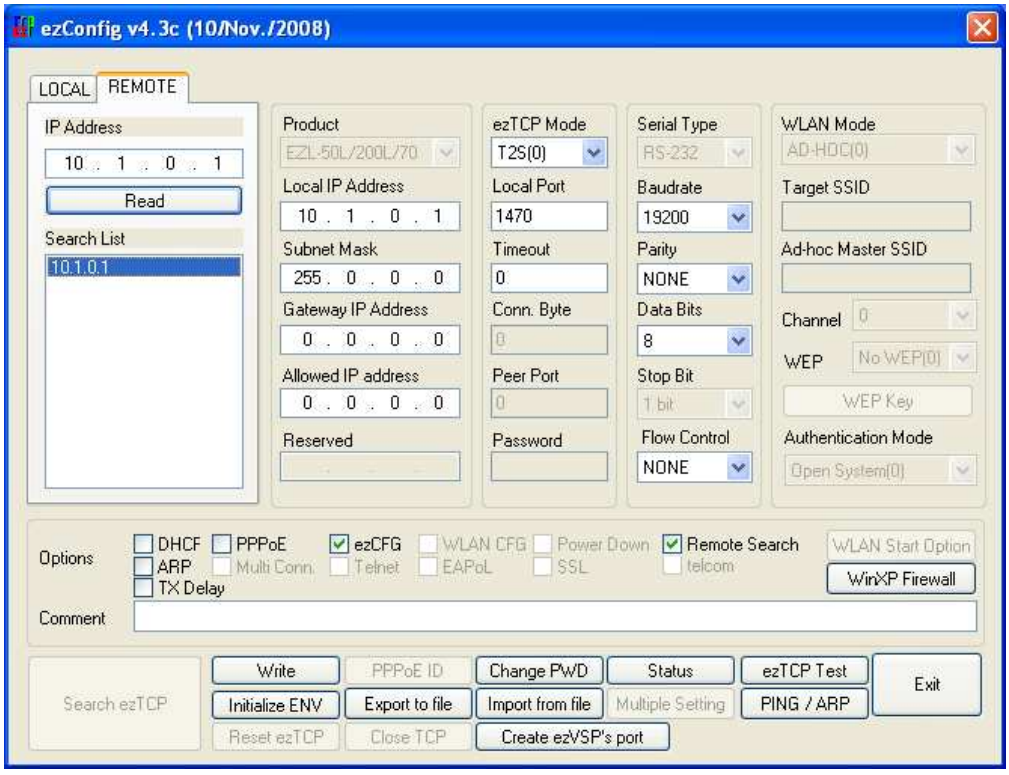
√ IP address, subnet mask, and gateway IP address of both PC and EZL-70 should be correct to succeed in ping test.

3.2.3. Example configuration of ezConfig (REMOTE)

- Input the IP address of EZL-70 in IP address field in the [REMOTE] tab, and press [Read] button. Then following window will be appeared.



- If the EZL-70 is found, the following will be shown.



- Configure variables and press [Write] button.

3.3. AT command

In ATC mode, the user can set environment variables through the serial port using AT command.

☞ **For more information, *See "6. ATC Mode".***

3.4. Setting IP Address-related Items by DHCP

Under environment with a network operating a DHCP server, DHCP protocol allows the user to automatically set the IP address, subnet mask, gateway, and name server of ezTCP. Using DHCP automatic setup function requires the user to check [DHCP] item on ezConfig.

3.5. Setting IP Address-related Items by PPPoE

PPPoE is used in most ADSL and VDSL. To use PPPoE function, PPPoE function should be enabled and PPPoE ID and PPPoE password should be configured. The local IP address of EZL-70 is assigned automatically in PPPoE environment.

√ ***Some ADSL or VDSL modem use DHC*P. Please contact your ISP (Internet Service Provider).**

4. Operation Mode

4.1. Operation Mode Overview

4.1.1. Overview

EZL-70 can operate in one of two modes (normal and ISP modes). Normal mode is ordinary data communication mode; and ISP mode is used to download EZL-70 firmware through the Ethernet (TFTP).

4.2. How to Initiate Each Operation Mode

4.2.1. How to Initiate Normal Mode

Normal mode is a mode in which EZL-70 performs its original functions. If ISP jumper (JP1) isn't set (is open) and EZL-70 boots up, EZL-70 operates in normal mode.

☞ **For more information, see "5. Normal Communication Mode".**

4.2.2. Entering ISP Mode

Supply power or reset to EZL-70 with ISP jumper (JP1) is set. If EZL-70 operates as ISP Mode, the yellow LED blinks rapidly.

4.2.3. Comparison of Operation Modes

The following table is the comparison of the above described operation modes.

Mode	How to Initiate	Description	Serial Port
Normal	Supply power or reset with ISP(JP1) is open	Normal data communication mode T2S, ATC, COD, U2S	User setting
ISP	Supply power or reset with ISP(JP1) is set	Download firmware through the Ethernet	19,200bps,N,8,1

4.3. Normal Communication Mode

EZL-70 operates normally in the Normal Communication Mode.

Normal communication mode can be classified into four modes – T2S, ATC, COD, and U2S – each of which is described in the following table.

Communication Mode	Protocol	Connection	Need for User Equipment Software Modification	Configuration of Environmental Variables through Serial Port	Topology
T2S	TCP	Passive Connection	Not needed	Impossible	1:1
ATC	TCP	Active/Passive Connection	Needed	Possible	1:1
COD	TCP	Active Connection	Not needed	Impossible	1:1
U2S	UDP	No Connection	Not needed	Impossible	N:M

TCP protocol requires connection process. The connection is always established as 1:1 connection. At this time, the host waiting for connection (passive connection) is called a server and the one attempting to connect (active connection) is called a client.
On the other hand, UDP communicates by block unit without connection process. As UDP does not require connection, numbers of hosts can communicate at the same time.

☞ **For more information on communication modes, refer to the next chapter.**

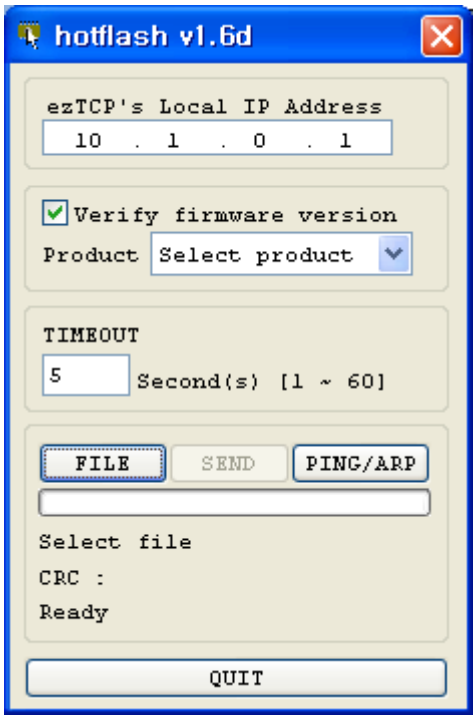
4.4. ISP Mode

In ISP mode, you can download the latest firmware (EZL-70 operation software) provided by our company.

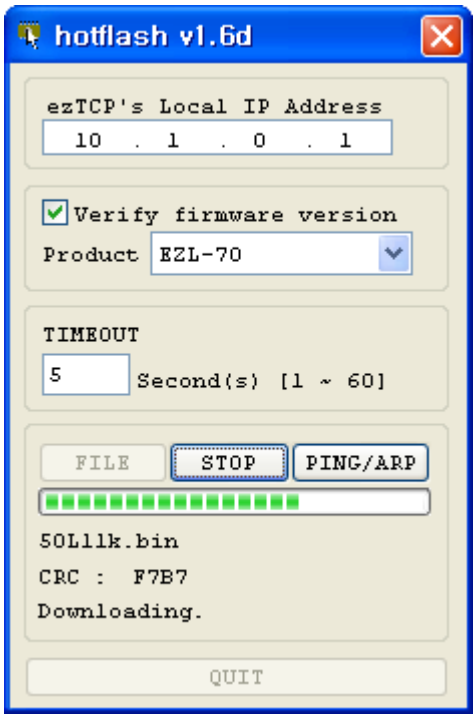
The following section describes how to download firmware in ISP mode.

- Supply power or reset to EZL-70 with ISP jumper set. If EZL-70 operates as ISP Mode, the yellow LED blinks rapidly.

- Run hotflash that is supplied by Sollae Systems.



- Select a firmware [FILE] and [Product], and input the IP address of EZL-70. After uncheck [Verify firmware version] option, press [SEND] button. Then the firmware will be transferred by Ethernet.



- After completion, a message that informs the firmware was downloaded successfully. And EZL-70 reboots automatically and run in Normal Mode. In Normal Mode, the yellow LED is blinked every 1 second.

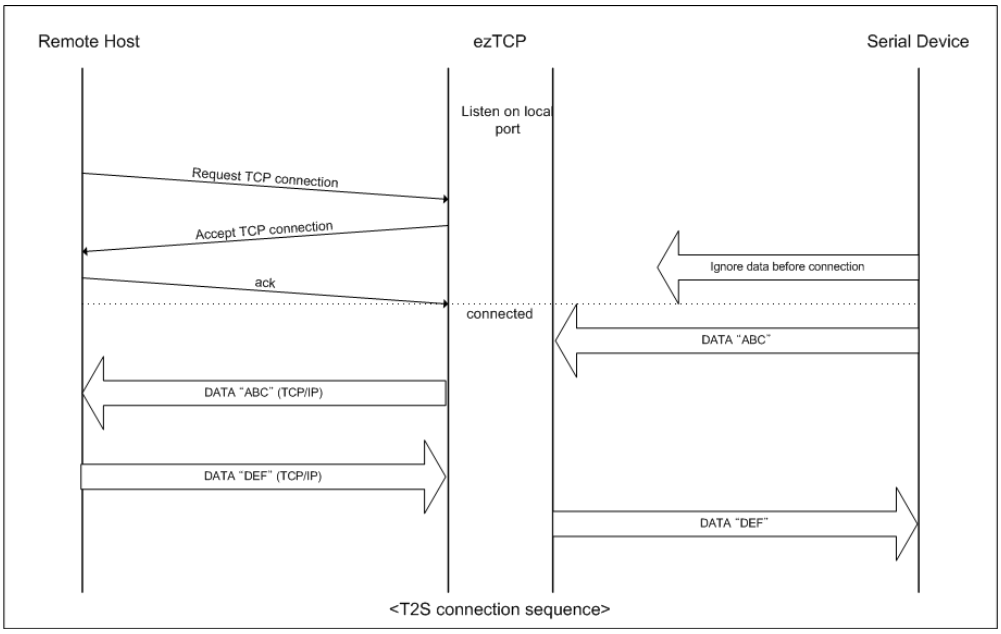
- After completion download, reset after ISP jumper open.

5. Normal Communication Mode

5.1. T2S - TCP Server

When a host connects to predefined local port, the EZL-70 accepts a TCP connection. When the EZL-70 accepts TCP connection, then the TCP connection is established. After connection is established, TCP/IP processing is performed on the data coming to the serial port, which is then transmitted to the remote host. And the TCP/IP data coming from the remote host is TCP/IP-processed and transmitted to the serial port to establish data communication. (Data coming to the serial port before TCP connection is established will be ignored.)

To limit the peer host, user should set [Allowed IP Address]. The only pre-defined host can be accessible. If [Allowed IP Address] is 0.0.0.0, any host can connect to EZL-70.



<T2S connection sequence>

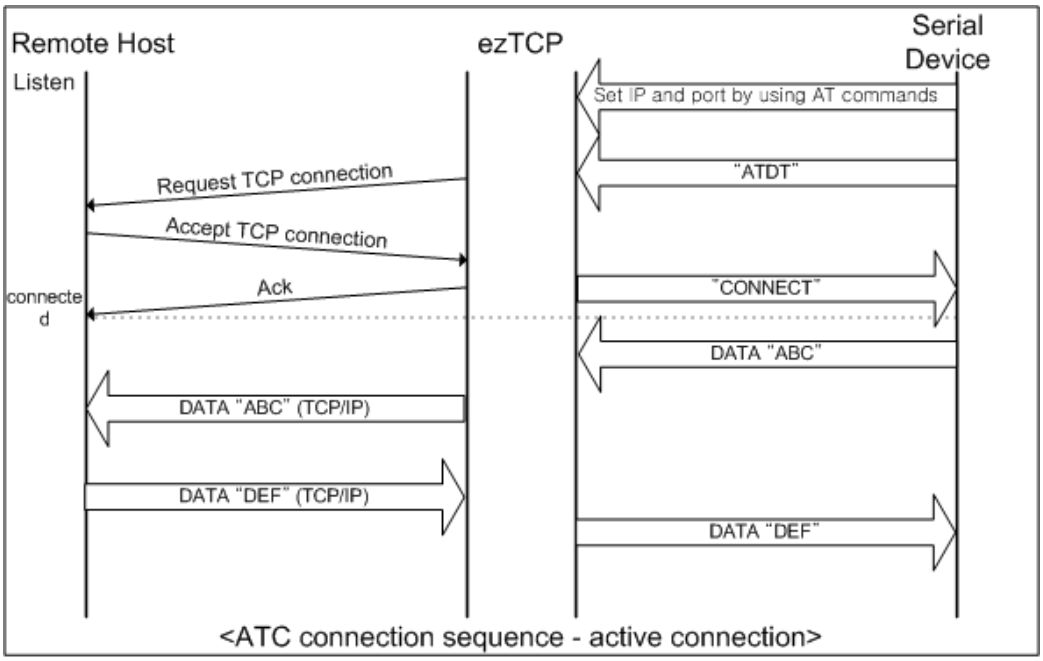
Set the following for T2S mode:

	Item	Description
IP Address Relate Items	Local IP Address	IP address of EZL-70
	Subnet Mask	Subnet Mask
	Gateway IP Address	IP address of Gateway
	Local Port	Port number for waiting to be connected
	Allowed IP Address	Allowed host to connect (if set to 0.0.0.0, any host can connect)
Serial Port	Baud Rate	Serial port speed (bps)
	Data Bits	Data Bits
	Parity	Parity
	Stop Bit	Stop Bit
	Flow Control	Flow control
Communication Mode	ezTCP Mode	Communication Mode (T2S(0))
Disconnection	Timeout	Limit time to keep connection
Configuration Method	ezConfig	Enable ezConfig function.
	Password	ezConfig password.
Dynamic IP	DHCP	Select to receive EZL-70 IP address as DHCP.
	PPPoE	Select to receive EZL-70 IP address as PPPoE.

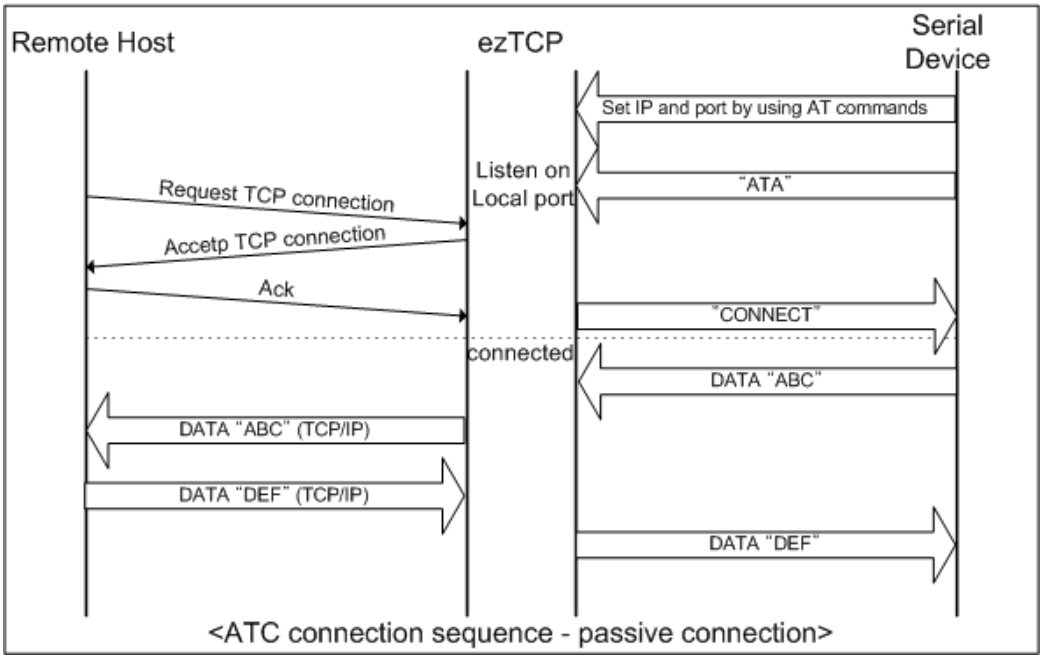
5.2. ATC

In ATC mode, the user can control the EZL-70 in a similar way to controlling the modem using AT command. In ATC mode, only a TCP connection is possible and both the server and the client can be configured.

In ATC mode, the AT command allows the user to set environment variables including the IP address and control TCP connection and disconnection.



<ATC connection sequence - active connection>



<ATC connection sequence - passive connection>

Set the following for ATC mode.

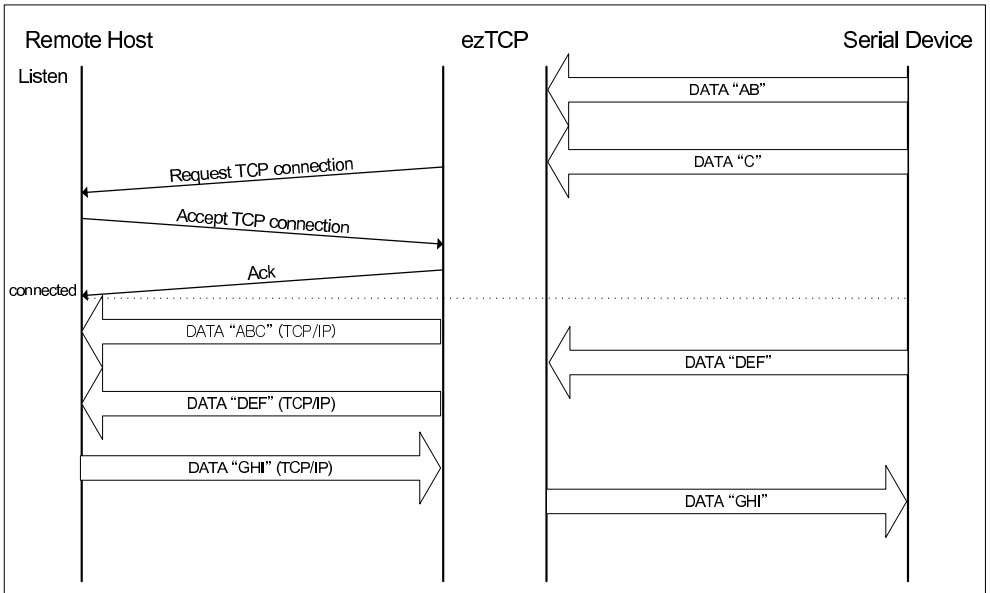
	Item	Description
IP Address Relate Items	Local IP Address	IP address of EZL-70
	Subnet Mask	Subnet Mask
	Gateway IP Address	IP address of Gateway
	Local Port	Port number for waiting to be connected in Server mode
	Peer IP Address	Peer IP address to connect
	Peer Port	Peer port number to connect
Serial Port	Baud Rate	Serial port speed (bps)
	Data Bits	Data Bits
	Parity	Parity
	Stop Bit	Stop Bit
	Flow Control	Flow control
Communication Mode	ezTCP Mode	Communication mode(ATC(1))
Disconnection	Timeout	Limit time to keep connection
Configuration Method	ezConfig	Enable ezConfig function.
	Password	ezConfig password.
Dynamic IP	DHCP	Select to receive EZL-70 IP address as DHCP.
	PPPoE	Select to receive EZL-70 IP address as PPPoE.

☞ ***See "6. ATC Mode" for more information.***

5.3. COD – TCP Client

In COD mode, the EZL-70 functions as a client.

When data of the pre-specified size [Conn. Byte] comes to the serial port, the EZL-70 attempts a TCP connection to the TCP port [Peer Port] of the preset host IP [Peer IP Address]. If the remote host accepts the TCP connection, TCP connection will be established. Data coming to the serial port after connection establishment is TCP/IP-processed and transmitted to the remote host. And, data coming from the remote host is TCP/IP-processed and transmitted to the serial port for data communication.



<COD connection sequence – Conn.Byte: 3>

Set the following for COD mode.

	Item	Description
IP Address Related Item	Local IP Address	IP address of EZL-70
	Subnet Mask	Subnet Mask
	Gateway IP Address	IP address of Gateway
	Peer IP Address	Peer IP address to connect
	Peer Port	Peer port number to connect
Serial Port	Baud Rate	Serial port speed (bps)
	Data Bits	Data Bits
	Parity	Parity
	Stop Bit	Stop Bit
	Flow Control	Flow control
Communication Mode	ezTCP Mode	Communication mode(COD(2))
Connection/ Disconnection	Conn. Byte	Bytes for starting to connect
	Timeout	Limit time to keep connection
Configuration Method	ezConfig	Enable ezConfig function.
	Password	ezConfig password
Dynamic IP Address	DHCP	Select to receive EZL-70 IP address as DHCP.
	PPPoE	Select to receive EZL-70 IP address as PPPoE.

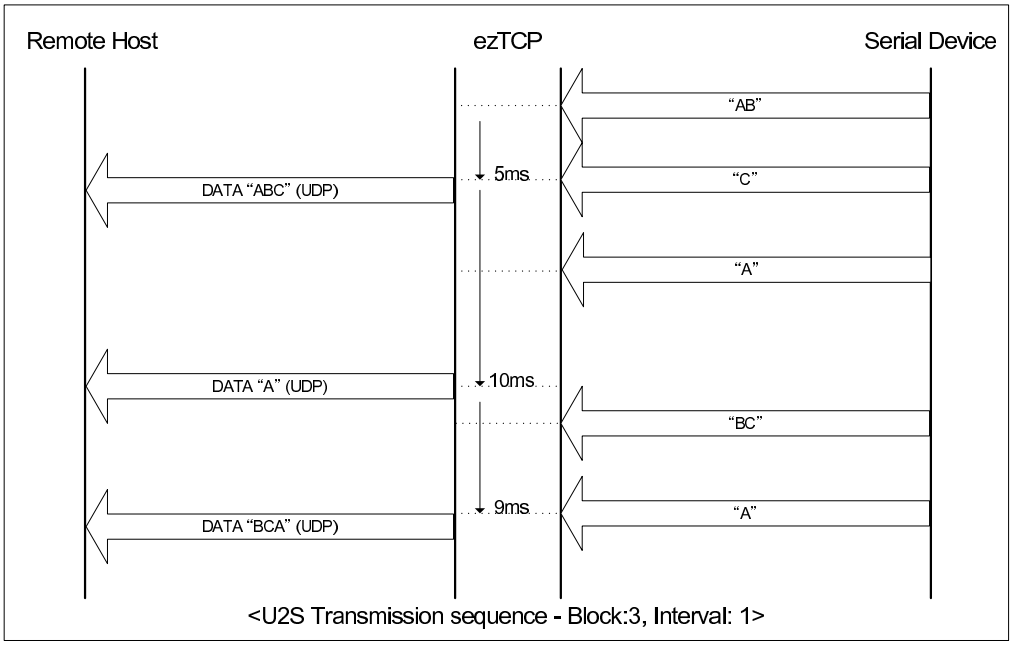
5.4. U2S - UDP

U2S mode allows for UDP communication.

In UDP mode, data are transmitted in blocks, which requires dividing data coming to the serial port into blocks before transmitting data. A procedure for dividing data into blocks is as follows:

If data of pre-specified bytes [Block] comes to the serial port of the ezTCP or if a specified period of time [Interval] elapses after first data reception, all data received for the same period is recognized as one block which is then transmitted to the UDP. The [Interval] unit is 10ms. If [Interval] is set to 2, the time period is between 20ms and 30ms.

Since UDP communication does not require a connection procedure, the user can establish N-to-M communication via multicast and broadcast.



<U2S Transmission sequence - Block:3, Interval: 1>

Set the following for U2S mode.

	Item	Description
IP address Related Item	Local IP Address	IP address of EZL-70
	Subnet Mask	Subnet Mask
	Gateway IP Address	IP address of Gateway
	Local Port	Port number for UDP data receiving
	Peer IP Address	Peer IP address to transmit
	Peer Port	Peer port number to transmit
Serial Port	Baud Rate	Serial port speed (bps)
	Data Bits	Data Bits
	Parity	Parity
	Stop Bit	Stop Bit
	Flow Control	Flow control
Communication Mode	ezTCP Mode	Communication mode(U2S(3))
Packets	Block	UDP block size to transmit (unit: byte)
	Interval	Data gathering time from serial port to transmit as UDP (unit:10ms)
Configuration Method	ezConfig	Enable ezConfig function.
	Password	ezConfig password.

6. ATC Mode

6.1. Overview

EZL-70 can be controlled by AT commands in ATC mode. For example, the peer host IP address can be set by AT+PRIP command and connect to the host by ATD command.

Therefore, EZL-70 communicates several hosts alternatively.

And also, it provides passive connection function by ATA command.

6.1.1. AT command format

AT Command starts with 'AT' and it ends with '<CR>'.

AT command form is as the following

AT	Command	<CR>(0x0d)

Result code for AT command is as the following

<CR>(0x0d)	<LF>(0x0a)	Result Code	<CR>(0x0d)	<LF>(0x0a)

Result Code – default settings is the 'ATV1'.

ATV1	ATV0	Description
OK	0	Command OK
CONNECT	1	TCP Connected
NO CARRIER	3	TCP Disconnected
ERROR	4	Command Error
NO ANSWER	8	No response from the remote host(PING)
Setting values	Setting values	Query currently setting values (Example: 192.168.1.200 For AT+PRIP? Commands)

6.2. Basic AT Command Set (Example: ATA, ATD etc.)

Command	Description	Comments
A	Passive connection	Wait for connection request from the remote host (The remote host → EZL-70)
D	Active connection	EZL-70 connects to the remote host (EZL-70 → The remote host)
E	Echo / No Echo	Decide whether to echo commands to serial port (E0 - No Echo, E1 - Echo)

H	Off hook	TCP Connection Close
I	Information	Returns the information of EZL-70 ATI3: Firmware version ATI7: MAC address
O	Return Online	Go back On-line state from Command state
Q	Quiet Mode	Decide whether to return result codes (Q0: Displays result codes Q1: Disable response to serial port)
S	S Register	S2: Escape Code(default: 43) S3: Carriage Return Code(default: 13) S4: Line Feed Code(default: 10) S5: Backspace Code(default: 8) S9: PING Test timeout(default: 6) S12: Escape Code Guard Time(default: 50)
V	Type of result codes	Result codes form (Numeric form - V0,Letter form - V1)
Z	Reset	Reset

6.3. Extended AT Command Set (Example: AT+PLIP etc.)

Command	Description	Comments
+PLIP	Local IP address	
+PSM	Subnet Mask	
+PGIP	Gateway IP address	default router
+PLP	(TCP)Listening Port	
+PTO	Time Out	
+PRIP	Remote host IP address	
+PRP	Remote host (TCP)port	
+PWP	Write Parameters to EEPROM	Save currently setting values
+PPNG	PiNG	PING Test
+PDC	Enable ezConfig function	ON: 1, OFF: 0
+PARP	Whether to use IP setting method using ARP	ON: 1, OFF: 0
+PDC	DHCP	ON: 1, OFF: 0

When values for this category is changed, it must be saved with AT+PWP command.

6.4. On-line State and Command State

The ezTCP can operate in either Command State or On-line State.

- Command State
  The ezTCP is Command State right after power on. Incoming serial data is treated as AT command
- On-line State
  When TCP connection is established, it automatically changes to On-line State. Incoming serial data is sent to the remote host.

In On-line State, user cannot send AT commands. In order to use AT commands during TCP connection, user must change to Command State.

☞ **For more details about state change, refer 6.4.1~2.**

Command State	When TCP connection is not established, AT commands may be used.
On-line State	During TCP connection, all of the data are converted to TCP/IP format.

6.4.1. Changing to Command State from On-line State

In order to change to Command State from On-line State, Escape Code (default: '+') must be sent 3 times according to the below sequence.

From last sent data to first '+' input	More than 500ms
'+' input interval	0~500ms
Delay time after last '+' input	More than 500ms

	Commands		Description
Data Communication (During TCP connection)			
	[guard time]+++[guard time]	▶	Change to Command State from On-line State
◀	<CR><LF>OK<CR><LF>		Conversion to Command State complete
	ATH	▶	TCP connection termination command
◀	<CR><LF>OK<CR><LF>		TCP connection termination

When sending +++, +++ is sent to the host.

6.4.2. Changing to On-line State from Command State

When the device is changed to Command State from On-line State during TCP connection, ATO command is used to go back On-line State.

	Commands		Description
Data Communication (During TCP connection)			
	[guard time]+++[guard time]	▶	Change to Command State from On-line State
◀	<CR><LF>OK<CR><LF>		Command State
~ Command State(wait for user AT command) ~			
	ATO	▶	Go back On-line State
◀	<CR><LF>CONNECT<CR><LF>		On-line State

6.5. Configure with Basic AT Commands

	Commands		Description
	ATS2?<CR>	▶	Escape Code?
◀	<CR><LF>43<CR><LF>		'+'(=43 = 0x2b)
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATS2=61<CR>	▶	Change the Escape Code to '='(= 61)
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATS12=40<CR>	▶	Change the Escape Code Guard Time to 40(400ms)
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATI3<CR>	▶	Return firmware version
◀	<CR><LF>Sollae Systems Co.,Ltd. ezTCP/LAN ATmega Rev.1.1K<CR><LF>		
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATI7<CR>	▶	Return the MAC address of EZL-70
◀	<CR><LF>0:30:F9:0:0:1<CR><LF>		Return the MAC address of EZL-70
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATV0<CR>	▶	Return result code in Number
◀	<CR><LF>0<CR><LF>		Command process OK

	ATQ1<CR>	▶	No result code
No result code			
	ATZ<CR>	▶	Reset
◀	<CR><LF>OK<CR><LF>		Command process OK

6.6. Configure with Extended AT Commands

	Commands		Description
	AT+PLIP=192.168.1.200<CR>	▶	LOCAL IP address setting
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PSM=255.255.255.0<CR>	▶	SUBNET MASK setting
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PGIP=192.168.1.254<CR>	▶	GATEWAY IP address setting
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PLP=1470<CR>	▶	LOCAL PORT setting
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PTO=10<CR>	▶	TIME OUT setting
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PWP<CR>	▶	Save setting values to EEPROM (Saved even after reset)
◀	<CR><LF>OK<CR><LF>		Command process OK
◀	<CR><LF>NO CARRIER<CR><LF>		System reset

6.7. Example of TCP Connection

6.7.1. Example for Active Connection – TCP Client

The ezTCP operates as TCP client like COD(2) ezTCP Mode. The below is the process of connecting to TCP server (IP address: 192.168.1.201, Port number: 1470)

	Commands		Description
	AT+PRIP=192.168.1.201<CR>	▶	Setting the remote IP address to connect
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PRP=1470<CR>	▶	Setting the remote Port number to connect

◀	<CR><LF>OK<CR><LF>		Command process OK
	ATDT<CR>	▶	Connecting to the remote host
Attempt connection to the remote host			
◀	<CR><LF>CONNECT<CR><LF>		TCP connection success
Data Communication			

6.7.2. Example for passive Connection – TCP Server

The ezTCP operates as TCP server like T2S(0) ezTCP Mode. The below is the example of setting as TCP server on 1470 port.

	Commands		Description
	AT+PLP=1470<CR>	▶	Set LOCAL PORT to listen
◀	<CR><LF>OK<CR><LF>		Command process OK
	ATA<CR>	▶	Wait for connection request
Wait for connection request from the remote host			
The remote host connects to EZL-70			
◀	<CR><LF>CONNECT<CR><LF>		TCP Connection OK
Data Communication			

6.8. Example for TCP Disconnection

6.8.1. Example for active disconnection

When EZL-70 attempts to close the connection,

	Commands		Description
Data Communication (During TCP connection)			
	[guard time]+++[guard time]	▶	Change to Command State from On-line State
◀	<CR><LF>OK<CR><LF>		Changed to Command State
	ATH	▶	Close TCP connection
◀	<CR><LF>OK<CR><LF>		Command process OK

6.8.2. Example for passive disconnection

When the remote host attempts to close the connection,

	Commands		Description
Data Communication (During TCP connection)			
The remote host attempts to close the connection			
◀	<CR><LF>NO CARRIER<CR><LF>		TCP connection is closed

6.9. Example of PING Test

	Commands		Description
	AT+PLIP=192.168.1.200<CR>	▶	LOCAL IP address setting
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PSM=255.255.255.0<CR>	▶	SUBNET MASK setting
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PGIP=192.168.1.254<CR>	▶	GATEWAY IP address setting
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PPNG=218.49.xxx.xxx<CR>	▶	Start PING Test
◀	<CR><LF>NO ANSWER<CR><LF>		No response from the remote host
	ATS9=3<CR>	▶	Change timeout of PING Test 6s (default setting) -> 3s
◀	<CR><LF>OK<CR><LF>		Command process OK
	AT+PPNG=218.49.xxx.xxx<CR>	▶	Start PING Test
◀	<CR><LF>OK<CR><LF>		Receive the response from the remote host

7. Technical Support, Warranty, and Precautions

7.1. Technical Support

If there are any questions regarding the product, please use FAQ or Q/A board in Sollae Systems's homepage. Also, feel free to contact us by email

Customer support homepage address: http://www.sollae.co.kr/Support

Email address: support@sollae.co.kr

7.2. Warranty

7.2.1. Refund

If user demands refund within 2 weeks of purchase, the product will be refunded

7.2.2. Free A/S

If product malfunctions within 1 year of purchase, repair and product exchange will be done without charge.

7.2.3. Charged A/S

Products after 1 year of purchase or product malfunctions due to user's miss care will be repaired and exchanged with charge.

7.3. Precautions

- If the product is modified, it is no longer guaranteed.
- Specifications of the product may be changed without prior notice.
- If the product is used for functions that are not covered by the product, the product is no longer guaranteed as well.
- All kind of Reverse Engineering is prohibited.
- It prohibits the use of firmware and provided applications for other purpose.
- Do not use the product in extreme temperature or vibration conditions.
- Do not use the product in highly humid and oily environment.
- Do not use the product in combustible or corrosive gas environment.
- The product functions are not guaranteed in environments with too much noise.
- Do not use this product for special cases requiring high quality and reliability such as space raveling, airplane, medicine, nuclear power, transportation, and other safety devices.
- If accidents or loss may occur using this product, Sollae Systems will not be liable for any compensation.

8. Ordering Information

Product	Description	Etc.
EZL-70-BO	RoHS Compliant	

9. Revision History

Date	Version	Comments
Apr.20.2006	1.1	Initial Release
May.29.2008	1.2	Add AT command(+ppng) Modify T2S, ATC, COD and U2S description Correct Some expressions and Screenshots
Oct.27.2008	1.3	Add features description(Slow TX, Reset, Close TCP) Add ezConfig button description Modify Ordering Information Add description of ATC active/passive connection Modify description of the firmware download Correct Some Expressions and Screenshots
Nov.11.2008	1.4	Slow TX → TX Delay Add “Create ezVSP’s port” button description Correct Screenshots of ezConfig